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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/035,603	12/28/2001	Robert M. English	112056-0036	3815

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EXAMINER

KERVEROS, JAMES C

ART UNIT	PAPER NUMBER
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2133

DATE MAILED: 01/27/2005.

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/035,603

Applicant(s)

ENGLISH ET AL.

Examiner

JAMES C KERVEROS

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 November 2004.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-59 is/are pending in the application.
- 4a) Of the above claim(s) 59 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 11-16, 19-23, 28, 29, 43 and 44 is/are allowed.
- 6) ☒ Claim(s) 1-10, 17-19, 24-27, 30-42 and 45-58 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 December 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This is a Final Office Action in response to Amendment filed November 16, 2004, responsive to the Office Action mailed August 25, 2004.

Claims 1-27 were previously examined. Claims 28-59 are added new.

Claims 1-59 are pending. Claim 59 is withdrawn from consideration as being directed to a non-elected invention. Claims 1-58 are presently under examination.

The objection to the abstract of the disclosure in the prior Office Action is withdrawn in view of the correction in the Amendment.

Election/Restrictions

2. Newly submitted claim 59 is directed to an invention that is independent or distinct from the invention originally claimed for the following reasons:

Claim 59 is drawn to Electromagnetic signals propagating on a computer network, for carrying instructions for execution on a processor for the practice of a method for correcting failures in a storage array. Claims 1-58 are drawn to a system and method for correcting failures in a storage array using a combination of a single diagonal parity group and multiple row parity groups, organizing the storage array as a plurality of concatenated sub-arrays.

The inventions are distinct, each from the other because of the following reasons:

Inventions (claim 59) and (claims 1-58) are related as subcombinations disclosed as usable together in a single combination. The subcombinations are distinct from each other if they are shown to be separately usable. In the instant case, invention (claim 59)

has as separate utility such as electromagnetic signals propagating on a computer network, which can be separately used in a communication system, and which does not require correcting failures in a storage array. See MPEP § 806.05(d).

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claim 59 is withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-10, 17-19, 24-27, 30-42 and 45-58 are rejected under 35 U.S.C. 102(b) as being anticipated by Han et al. (US 6158017).

Regarding Claims 1, 2, 3, 26, 27, Han discloses (FIG. 2) a structure of a disk array for correcting storage device failures arranged in a combination of first and secondary parity groups corresponding to diagonal and horizontal parity groups together with parity blocks (DH2), as shown in FIG. 4, comprising:

A storage disk array defined as a matrix of $(N-1) \times (N+1)$ having a plurality of concatenated sub-arrays ($N+1$ disks) each logically divided into $N-1$ data blocks of a

row being defined as a horizontal parity group and as a diagonal parity group, defining the data blocks of the last disk as the horizontal parity blocks, and defining the data blocks existing in the (N-1) row of the matrix as the diagonal parity blocks. The contents of each of the horizontal and diagonal parity groups are logically (XOR) to obtain the parity value stored into the parity block of the corresponding horizontal or diagonal parity group, and further analyzing the diagonal parity group and the horizontal parity group to restore error data block, where the analyzing step is repeated to completely rebuilt the data contents of the failed disks. The secondary parity values, such as the diagonal parity group values, are computed across the concatenation of the sub-arrays, according to diagonal parity blocks and groups (Definition 6) (Summary of the Invention, Col. 3, lines 20-40). Also, refer to (FIGS. 4 and 8 to 10), for a structure of the DH2 parity arrangement (Definition 4), horizontal parity blocks and groups (Definition 5), diagonal parity blocks and groups (Definition 6).

Regarding Claims 10, 24, 25, 30-42, 45-58, Han discloses the pertinent limitations as applied to Claim 1, above and in addition he discloses means for computing the diagonal parity for the single diagonal parity group across the concatenated sub-arrays, according to (Definition 6) for defining the Diagonal Parity Groups and Blocks in DH2 Parity Arrangement. "The data blocks, existing in each rightwardly and upwardly closed looped diagonal line, are defined as an error correction group of diagonal parities". Also, "FIG. 10 depicts the arrangement of the parities and data in the form of a matrix in the case of N=7 in the DH2 parity arrangement.

Reference numerals H0 to H4 represent the horizontal parity blocks of the horizontal

parity group Nos. 0 to 5, and D0 to D6 represent the diagonal parity blocks of the diagonal parity group Nos. 0 to 6. Each of the data blocks is identified by i and j, where i represents the horizontal parity groups and j the diagonal parity groups.

Correcting the storage device failure within the array using the row parity storage device associated with each sub-array and the global diagonal parity storage device associated with the storage array, including the step of "analyzing a diagonal parity group including an error data block of the two failed disks to restore the error data block and then, the horizontal parity group including the restored error data block to restore another error data block, wherein the last analyzing step is repeated to completely rebuild the data contents of the two failed disks" (See Abstract).

Regarding Claims 4, 5, Han discloses (controller 4, FIG. 2) for performing an encoding and decoding algorithm of the DH2 parity arrangement, FIG. 2. The parity storage algorithm provides a method for obtaining the parity values of the data blocks of the parity groups by XOR'ing, FIG. 15. The disk array of $(N-1) \times (N+1)$ is controlled by the controller 4 (FIG. 2) to store the horizontal and diagonal parities respectively, steps (210 and 220). In step 210, the controller 4 calculates upon the horizontal parities of the horizontal parity group Nos. 0 to $(N-3)$ to encode the horizontal parity blocks with the corresponding horizontal parities. In step 220, the controller calculates the diagonal parities of the diagonal parity group Nos. 0 to $(N-1)$ to encode the diagonal parity blocks with the corresponding diagonal parities.

Regarding Claim 6, Han discloses EVENODD parity encoding, illustrating a map of parity blocks (when disk number $N=7$) to be accessed to update diagonal S blocks in an EVENODD arrangement, FIG. 25.

Regarding Claims 7, 8, 17, 18, Han discloses a plurality of concatenated sub-arrays ($N+1$ disks) each logically divided into $N-1$ data blocks, FIGS. 2 and 4, wherein each sub-array (DISK) is organized as a distributed parity disk array (FIGS. 4 and 8 to 10).

Regarding Claim 9, Han discloses storage devices, which is magnetic disk device.

Allowable Subject Matter

4. Claims 11-16, 19-23, 28, 29, 43 and 44 are allowed.

The following is an examiner's statement of reasons for allowance:

The prior arts of record taken alone or in combination fail to teach, anticipate, suggest or render obvious the claimed invention, as recited in the independent claims 11, 19, 28, 29, 43 and 44.

Claims 11 and 19 are now allowable, because they are rewritten in the independent form including all of the limitations of the base claim and any intervening claims, as required by the prior Office Action.

Claims 28, 29, 43 and 44 include similar allowable subject matter as recited in Claims 11 and 19.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably

accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Response to Arguments

5. Applicant's arguments filed November 16, 2004 have been fully considered but they are not persuasive. Claims 1-10, 17-19, 24-27, 30-42, 45-58 are rejected under 35 U.S.C. 102(b) as being anticipated by Han et al. (US 6158017) and Claims 11-16, 19-23, 28, 29, 43 and 44 are allowed, as set forth in the present Office Action. In response to applicant's argument that the Han reference fail to show certain features of applicant's invention, it is noted that Han anticipates the claimed invention as stated in the present Office Action.

6. In summarizing the claimed limitation, as argued by the Applicant in his remarks, with respect to the independent claim 1, clearly Han discloses a system (Figures 2, 4, 8-10) illustrating the structure of a disk array according to a DH2 (diagonal and horizontal) parity arrangement to correct multiple storage device failures in a storage array using a combination of multiple first parity groups such as Figure 9 illustrates "the diagonal parity groups with identification numbers in the case of N=7, where the blocks D0 to D6 marked with dots represent the diagonal parity blocks", and a single secondary parity group, such as Figure 10 depicting the "arrangement of the parities and data in the form of a matrix in the case of N=7 in the DH2 parity arrangement. Reference numerals H0 to H4 represent the horizontal parity blocks of the horizontal parity group Nos. 0 to 5,

and D0 to D6 represent the diagonal parity blocks of the diagonal parity group Nos. "0 to 6", the system comprising:

A storage array (Figures 8-10) having a plurality of concatenated sub-arrays (d0-d6), each sub-array (d0-d6) including a set of data storage devices such as "the data blocks is identified by i and j, where i represents the horizontal parity groups and j the diagonal parity groups", and a first parity storage device corresponding to (D0-D6) representing the diagonal parity blocks of the diagonal parity group Nos. "0 to 6", the array further including a global secondary storage device (H0 to H4) represent the horizontal parity blocks of the horizontal parity group Nos. 0 to 5 and holding secondary parity values (horizontal parity blocks) for the single secondary parity group, the secondary parity values computed across the concatenation of the sub-arrays.

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

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extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to JAMES C KERVEROS whose telephone number is (571) 272-3824. The examiner can normally be reached on 9:00 AM TO 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Albert Decady can be reached on (571) 272-3819. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

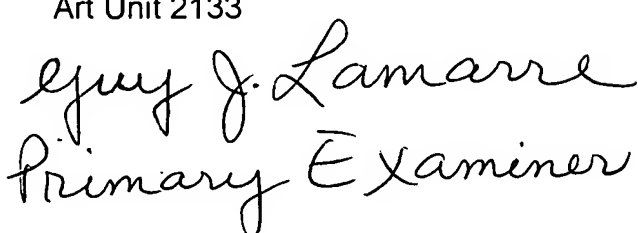
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Date: 19 January 2005
Office Action: Final Rejection

By: 

JAMES C KERVEROS
Examiner
Art Unit 2133


Primary Examiner